

WHAT IS CLAIMED IS:

1. A radio-frequency amplifier comprising:
a transistor having an input terminal, an output
5 terminal, a control terminal, and a transconductance g_m ;
a series-connected feed-through resistance R_f and feed-
through capacitance C_f connected in parallel with the input
terminal and the output terminal of the transistor;
a load resistance R_L connected to the output terminal of
10 the transistor; and
wherein the control terminal of the transistor is biased
at a fixed voltage.
2. The radio-frequency amplifier of claim 1 further
15 comprising a tank circuit connected between a voltage source
 V_{dd} and the input terminal of the transistor.
3. The radio-frequency amplifier of claim 1 driven by
a signal source with output impedance R_s , wherein the
20 transconductance g_m of the transistor is larger than $1/R_s$.
4. The radio-frequency amplifier of claim 1 wherein
the feed-through resistance R_f is formed by a real resistor R_p
in parallel with the transistor drain-source small-signal
25 resistance r_{ds} .
5. The radio-frequency amplifier of claim 3 wherein
the feed-through resistance R_f further comprises an inductance
 L_p .

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6. The radio-frequency amplifier of claim 6 wherein the transistor and a signal source impedance R_s satisfy the equation:

$$g_m = \frac{1}{R_s} \left(\frac{\delta \alpha}{\gamma} (1 + \chi)^2 \eta(\omega_0) + \eta^2(\omega_0) \right)^{\frac{1}{2}}$$

5 where

δ = a gate noise coefficient of the transistor,

α = a ratio of g_m to a channel conductance at zero drain-to-source voltage of the transistor, g_{d0} ,

10 γ = a channel thermal noise coefficient of the transistor,

χ = a ratio of a backgate transconductance g_{mb} of the transistor to g_m ,

ω_0 = an operation frequency, and

15 $\eta(\omega_0)$ = a ratio of a gate admittance g_g of the transistor to g_m .

7. The radio-frequency amplifier of claim 1 wherein the tank circuit comprises a parallel combination of a resistance, a capacitance, and an inductance.

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8. A high-frequency CMOS low noise amplifier comprising:

a first stage including a common-gate amplifier with a feed-through resistance R_f ;

5 a second stage coupled to the first stage including a common-source amplifier with inductive degeneration; and

a third stage coupled to the second stage including a common-source amplifier with inductive degeneration.

10 9. The high-frequency CMOS low noise amplifier of claim 8 wherein the feed-through resistance R_f is formed by a resistance R_p in parallel with a transistor drain-source resistance r_{ds} .

15 10. The high-frequency CMOS low noise amplifier of claim 8 wherein the feed-through resistance R_f further comprises an inductance L_p .

20 11. The high-frequency CMOS low noise amplifier of claim 8 driven by a signal source with output impedance R_s , wherein a transconductance g_m of the input transistor is larger than $1/R_s$, a series-connected resistor R_f and capacitor C_f is connected between the input terminal and the output terminal of the input transistor, so that the real part of an
25 input impedance of the high-frequency CMOS low noise amplifier is increased.

12. A radio-frequency amplifier comprising:
a common gate amplifier having an input and an output;
and

a resistive feed-through circuit having a resistance R_f
5 coupled in parallel with the output of the common gate
amplifier, wherein the resistive feed-through circuit reduces
output noise power.

13. The radio-frequency amplifier of claim 12 wherein
10 the resistive feed-through circuit further comprises an
inductance L_p .

14. The radio-frequency amplifier of claim 12 wherein
the resistive feed-through circuit comprises a feed-through
15 resistance R_p and a feed-through capacitance C_p .

15. The radio-frequency amplifier of claim 12 wherein
the common gate amplifier and a signal source impedance R_s
satisfy the equation:

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$$g_m = \frac{1}{R_s} \left(\frac{\delta \alpha}{\gamma} (1 + \chi)^2 \eta(\omega_0) + \eta^2(\omega_0) \right)^{-\frac{1}{2}}$$

where

g_m = an amplifier transconductance,
 δ = a gate noise coefficient of the amplifier,
 α = a ratio of g_m to a channel conductance at zero
25 drain-to-source voltage of the amplifier, g_{d0} ,
 γ = a channel thermal noise coefficient of the
amplifier,
 χ = a ratio of a backgate transconductance g_{mb} of the
amplifier to g_m ,
30 ω_0 = an operation frequency, and

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PATENT APPLICATION

$\eta(\omega_o)$ = a ratio of a gate admittance g_g of the amplifier
to g_m .